

SILICON CARBIDE METAL-SEMICONDUCTOR FIELD EFFECT
TRANSISTORS AND METHODS OF FABRICATING
SILICON CARBIDE METAL-SEMICONDUCTOR FIELD EFFECT
TRANSISTORS

Abstract of the Disclosure

SiC MESFETs are disclosed which utilize a semi-insulating SiC substrate which substantially free of deep-level dopants. Utilization of the semi-insulating substrate may reduce back-gating effects in the MESFETs. Also provided are SiC MESFETs with a two recess gate structure. MESFETs with a selectively doped p-type buffer layer are also provided. Utilization of such a buffer layer may reduce output conductance by a factor of 3 and produce a 3db increase in power gain over SiC MESFETs with conventional p-type buffer layers. A ground contact may also be provided to the p-type buffer layer and the p-type buffer layer may be made of two p-type layers with the layer formed on the substrate having a higher dopant concentration. SiC MESFETs according to embodiments of the present invention may also utilize chromium as a Schottky gate material. Furthermore, an oxide-nitride-oxide (ONO) passivation layer may be utilized to reduce surface effects in SiC MESFETs. Also, source and drain ohmic contacts may be formed directly on the n-type channel layer, thus, the n^+ regions need not be fabricated and the steps associated with such fabrication may be eliminated from the fabrication process. Methods of fabricating such SiC MESFETs and gate structures for SiC FETs as well as passivation layers are also disclosed.